B. Tech. 1st Semester (Common to all branches)
Chemistry-I (CHY-101T)
(2014-15 onwards)

L	T	P
3	1	-

Theory:	50 Marks
Sessional:	50 Marks
Total:	100 Marks
Time:	3 Hrs.

1. **Chemical Kinetics:** Second order reactions, derivation of velocity constant with same and different concentrations of the reactants, half life period, basic concepts of complex reactions, determination of rate constant, collision theory and absolute reaction rate theory. **04 L**

2. **Electrochemistry and Corrosion**: Types of electrodes, half cell reactions, electrochemical cells, concentration cells. Theories of corrosion, types of corrosion (water-line corrosion, stress corrosion, pitting corrosion, microbiological corrosion). Factors affecting the rate of corrosion, devices for the control of corrosion (design, cathodic protection, modification of environment and protective coatings). **08 L**

3. **Photochemistry:** Photochemical and dark reactions, laws of photochemistry, quantum efficiency, classification of photochemical reactions on the basis of their quantum efficiencies, Non-radiative processes (isc and ic), fluorescence, phosphorescence (Jablonski diagram), chemiluminiscence and photosensitization. Technology based on photochemical processes. **06 L**

4. **Phase Rule:** Description of various terms (phase, component and degrees of freedom). One component system (water and sulphur systems), freeze drying. Two components system with simple eutectic formation (Pb-Ag and KI-H_2O systems), solders, safety plugs and freezing mixtures. **06 L**

5. **Organic Chemistry:** Reaction intermediates (carbocations, carbanions, carbenes and free radicals), aromaticity and Huckel treatment of organic compounds, reaction mechanisms: SN^1, SN^2, E^1 and E^2 reactions, aromatic nuclecophilic substitution and aromatic electrophilic substitution reactions. **04 L**

6. **Bioorganic Chemistry:** Elementary knowledge of enzymes and coenzymes, carbohydrates, proteins, lipids and their biodegradation. **06 L**

7. **Coordination Chemistry:** Coordination compounds, various theories of bonding: ligand field theory, crystal field theory, molecular orbital theory, determination of CFSE of few complex compounds (octahedral compounds), important applications of coordination compounds. **06 L**

8. **Modern techniques in structural elucidation of compounds:** Introduction to spectroscopy, electro-magnetic spectrum, principles, schematic diagrams of instruments and applications of UV-VIS, IR and NMR spectroscopy. **04 L**

9. **Nanochemistry:** Introduction, general methods of synthesis, characterization and applications of nano materials. **04 L**

Total: 48 L

Note: The Paper Setter is requested to set eight questions in all. The students are required to attempt any five questions.

Books Recommended:

1. Concise Inorganic Chemistry by J.D. Lee.
2. Reaction mechanism in Organic Chemistry by S.M. Mukherji and S.P. Singh.
3. Nano biotechnology: Concept, applications and perspectives by C.M. Niemeyer and C.A. Mirkin.
4. Bioelectric Engineering Vol. II, Biological nanostructures and applications of nanostructures in Biology: Electrical, mechanical and optical properties by M.A. Stroscio and M. Dutta.
5. Principles of Instrumental Analysis by D.A. Skoog, F.J. Holler and S.R. Crouch.
6. Principles of Physical Chemistry by B.R. Puri, L.R. Sharma and M.S. Pathania.
7. Chemistry in Engineering and Technology by T. Raja Ram and J.C. Kuriascose.
8. Engineering Chemistry by P.C. Jain and Monika Jain.
9. Chemistry for Environmental Engineering by C.N. Sawyer and P.L. McCarthy and G.F. Parkin.
10. Biochemistry by M.K. Campbell and S.O. Farrell.

B. Tech. 2nd Semester (Common to all branches)
Chemistry-II (CHY-102T)
(2014-15 onwards)

L	T	P		
2	1	-	Theory:	50 Marks
			Sessional:	50 Marks
			Total:	100 Marks
			Time:	3 Hrs.

1. **Polymers:** Types and mechanisms of polymerization (free radical, anionic, cationic and coordination), effect of structure on properties of polymers, thermosetting resins (bakelite, epoxy), thermoplastics (low and high density polythenes, PMMA), rubbers (GR-S and GR-N) and their technical/industrial uses. Inorganic polymers: preparation, properties and technical/industrial uses of silicones**.** **06 L**

2. **Water Treatment**: Preparation of polished (intrinsic) water to be used for electronics devices, demineralization, desalination. Problems faced during the course of steam generation in boilers: scale and sludge formation, priming and foaming and boiler corrosion. Determination and significance of DO, BOD and COD. **05 L**

3. Fuels: Calorific value (HCV and LCV), determination of HCV by Bomb's calorimeter/Boy's gas calorimeter, proximate and ultimate analysis of coal. Coal liquification (Bergius and Fischer-Tropsch methods). Coal gasification (water gas and coal gas). **06 L**

4. Environmental Chemistry: Ozone layer depletion, photochemical smog, acid rain, green house effect, Bhopal gas release accident. Green Chemistry: Introduction, basic components and significance of Green Chemistry. **05 L**

5. Lubricants: Introduction and classification of lubricants, determination and significance of properties of oils (viscosity, viscosity index, acid value, saponification value, iodine value, pour point, cloud point, aniline point), greases, solid lubricants and related numericals. **05 L**

6. Inorganic Engineering Materials: Cement-composition and setting of cement; Glass-composition, properties, manufacture and types of glasses; Explosives-introduction, classification, requisites of explosives, plastic explosives, RDX, TNT and PETN. **06 L**

Total: 33 L

Note: The Paper Setter is requested to set eight questions in all. The students are required to attempt any five questions.

Books Recommended:

1. Environmental Chemistry by A.K. De.
2. Engineering Chemistry by P.C. Jain and Monika Jain.
3. Applied Chemistry, Theory and Practice by O.P. Vermani and A.K. Narula.
4. Industrial Chemistry by O.P. Vermani.
5. A text book of Engineering Chemistry by Shashi Chawla.

B. Tech. Ist Semester (Common to all branches)
Chemistry-I Practical (CHY-103P)
(2014-15 onwards)

L	T	P
-	-	2

Sessional	:	60 Marks
End Sem. Exam.	:	40 marks
Total	:	100 marks
Time	:	3 Hrs.

S.No. **List of Experiments**

1. Determination of the strength (gL^{-1}) of Cu(II) ions present in a given copper ore solution iodometrically.
2. Determination of the strength (gL^{-1}) Fe(II) and Fe(III) ions present in a given iron ore solution by internal indicator method.
3. Determination of the rate constant for 2^{nd} order reaction.
4. Determination of manganese dioxide in pyrolusite.
5. Estimation of nickel by gravimetric method as bis(dimethylglyoximato)nickel(II).
6. Determination of the strength (gL^{-1}) of strong acid and strong base/weak acid and strong base using conductometric titration method.
7. Separation of organic compounds using thin layer chromatographic technique.
8. Assignment of functional groups of given organic compounds (acids, esters, alcohols, aldehydes, amines etc.) by IR spectroscopic technique.
9. Detection of transition metal ions of different oxidation states.
10. Syntheses of Cu(II)/Fe(II)/(III) coordination compounds containing organic ligands and their characterization (m. pt., solubility test, yield, conductance and UV).
11. Identification of types of carbohydrates in the given sample.
12. Test for proteins and lipids.
13. Synthesis of nano materials and their characterization.
14. Determination of the composition of a liquid mixture by surface tension method using stalagmometer.
15. Investigatory project based on syllabus.

B. Tech. 2nd Semester (Common to all branches)
Chemistry-II Practical (CHY-104P)
(2014-15 onwards)

L	T	P
-	-	2

Sessional	:	60 Marks
End Sem. Exam.	:	40 marks
Total	:	100 marks
Time	:	3 Hrs.

S.No.	List of Experiments
1.	Determination of nitrite ions present in tap water.
2.	Determination of alkalinity of irrigation water.
3.	Determination of D.O. in the given sample of water.
4.	Determination of total, calcium and magnesium hardness of water by EDTA titration method.
5.	Determination of calcium as calcium oxide volumetrically in cement extract solution.
6.	Determination of viscosity of lubricants by Redwood viscometer.
7.	Determination of acid value of an oil.
8.	Determination of saponification value of an oil.
9.	Determination of iodine value of an oil.
10.	Determination of flash point of lubricant.
11.	Determination of cloud and pour point of lubricant.
12.	Preparation of (a) Phenol-formaldehyde resin and (b) urea-formaldehyde resin.
13.	Determination of nitrogen and sulphur in coal.
14.	Investigatory project based on syllabus.